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# SDN-DMM BASED MOBILITY MANAGEMENT FOR SEAMLESS HANDOVER

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**ABSTRACT**

*In recent years, the mobile user benefits ubiquitous coverage through various wireless access technologies with supporting internet protocol (IP) backbone. Therefore, this paper focuses on this issue and provides optimized routing by an enhanced software-defined networking and distributed mobility management (SDN-DMM) based mobility solutions. The presented work utilities the network-based proxy mobile IPv6 (PMIPv6) protocol to handle mobility for the mobile node (MN). The DMM redeploys the function of the centralized anchor in a distributed way, and the SDN controller readjusts the data plane for the MN mobility and thereby maintaining the transparency of the MN. Simulation results validate the efficiency of the proposed work in terms of handover delay and packet loss rate.*

***Keywords**: Heterogeneous Network, Routing, Handover, Distributed Mobility Management, Software Defined Networking, PMIPv6.*

## INTRODUCTION:

Due to this rapid evolution, the mobile network architecture has to support a large volume of data traffic in order to satisfy the required quality of service (QoS) for the user applications. Both centralized mobility management (CMM) and DMM scheme suffer a fundamental challenge of sub-optimal routing across inter-domain environment to support seamless ongoing session with efficient route optimization. The SDN based application layer scheme [1] is used to utilize the vehicle state information for ensuring the quality of experience of all the vehicles. The device to device (D2D) communication [2] is also an emerging research area in cellular communication. The novel optimized message mapping and signaling mechanism for handover failure and preparation phases are presented in [3]. Later, the mobility management and admission control modules in the SDN controller is introduced to calculate the transition probability and to estimate the resource availability in the neighbor network. The neighbor network with high selection probability is chosen as the best targets network, this results in a lot of arithmetic computations and thus increases handover latency. The major limits of this approach [4] are not considering the network and user condition into account. The SDN based architecture for future generation wireless network is illustrated in [5, 6] and their experimental results prove that this approach decreases the handover latency.

Hence the purpose of this work is to introduce the SDN based DMM concept of flat architecture to handle mobility, which is extremely suitable for designing the future generation mobile networks. The rest of the paper is organized as follows: Section 2 describes the proposed SDN-DMM based mobility management, section 3 provides the simulation results and discussion and finally, section 4 presents the conclusion and scope for future work.

## SDN-DMM MOBILITY MANAGEMENT:

An SDN–DMM based mobility management in the integrated networks are clearly explained in this section. The reference scenario as shown in Fig. 1 clearly depicts the communication of MN before and after the handover process. The architecture consists of an SDN controller, which interfaces to the upper plane The SDN controller also interfaces to the lower plane router and switches. The WLAN and WiMAX network is connected to its own access point (AP) and the base station (BS) with the switches A and B) and routers A and B in order to send and receive the signal from and to the MN [7,8]. The correspondent node (CN) is connected to router C.

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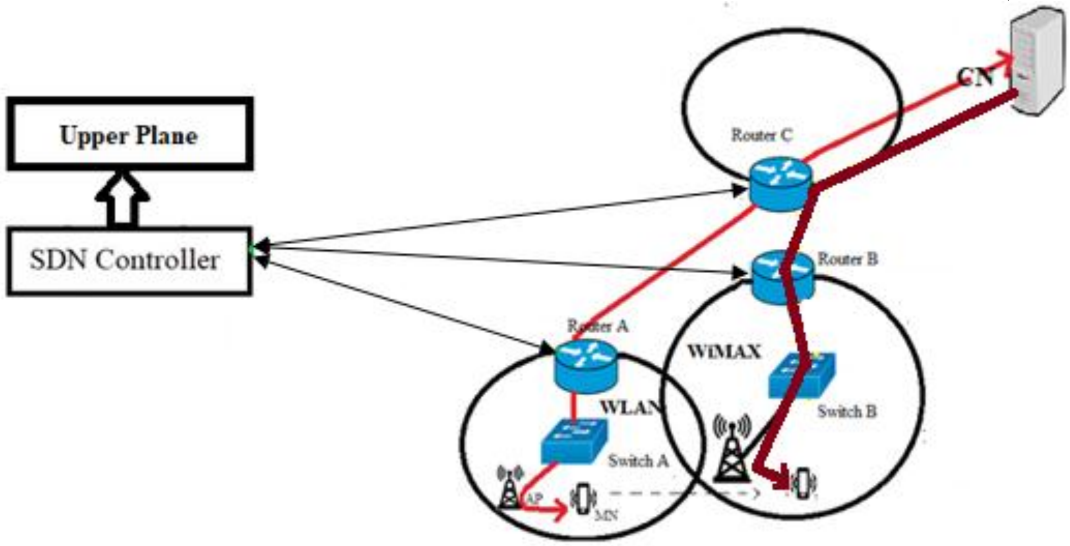


**Figure 1. SDN-DMM based mobility management**

**Before handover:**

The MN initially attached to the WLAN network, communicates to the CN with the IP flow between the MN and CN through router A and router C. In the initial procedure, MN is attached to the WLAN network with router A. The router A sends update message to the SDN controller. The SDN controller updates the database and sends open flow rules to the lower nodes in to configure the route between MN and CN. At last, the MN communicates to the CN through IP flow from MN to switche A to router A to router C to CN.

**After handover:**

After some time, the MN moves towards the second network and wants to continue the session. The router B sends a update message to the SDN controller. The controller identifies the MN previous state and detects the mobility at the router B. The SDN controller has control over the changes in the topology of the network. Therefore, it calculates the new path for MN mobility and sends open flow rules to nodes in order to reestablish the link. The CN is also knowing the MN new mobility through OF rules. Finally, the IP flow is connected between the MN and CN. Therefore, the data packets are forwarded to and from MN without a tunneling mechanism. Thus SDN-DMM achieves optimization route before and after handover, which in turn reduces the handover latency.

**SIMULATION RESULTS AND DISCUSSION:**

In this section, the performance evaluation of the proposed SDM-DMM based mobility management is implemented in OPNET software. The simulation results are compared with the existing CMM scheme in terms of handover delay, packet delay variation, and packet loss ratio for voice traffic. In the existing CMM scheme, all the mobility signaling are routed via centralized localized mobility anchor (LMA), which tends to increase signaling overhead due to the MN binding management and tunneling, whereas in the case of SDN-DMM based mobility management, the SDN controller calculates optimized path by adjusting the network equipment's involved. Thus the tunneling process is completely eliminated and thus greatly reduces the handover delay when compared to the existing CMM scheme as in Fig. 2

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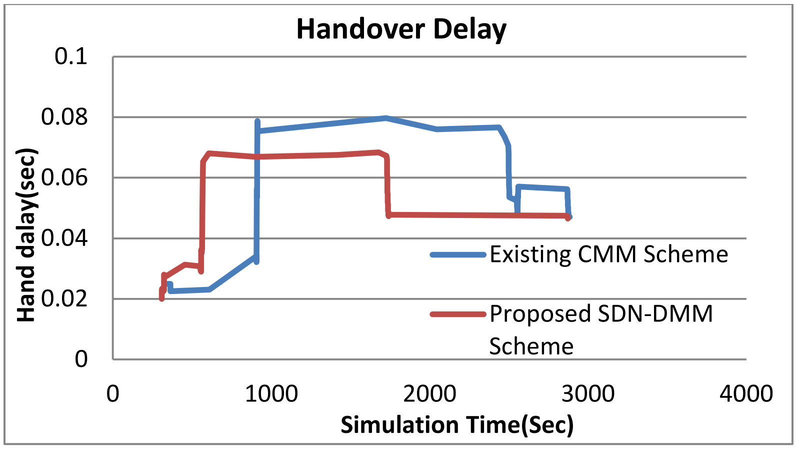


**Figure 2. Handover delay**

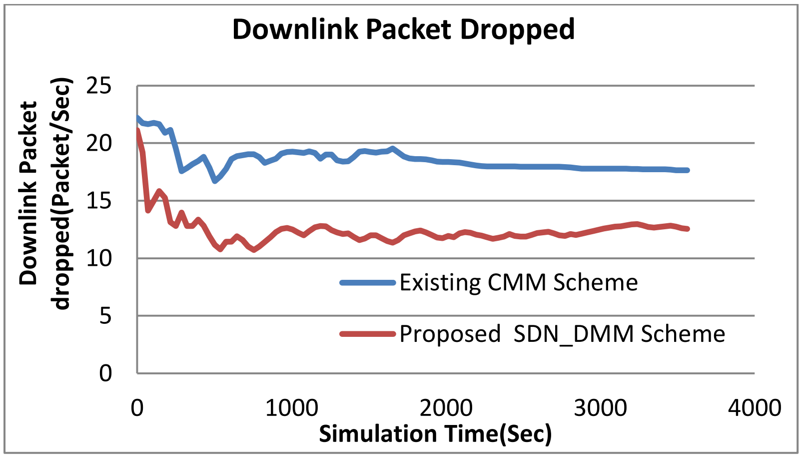


**Figure 3. Packet dropped ratio**

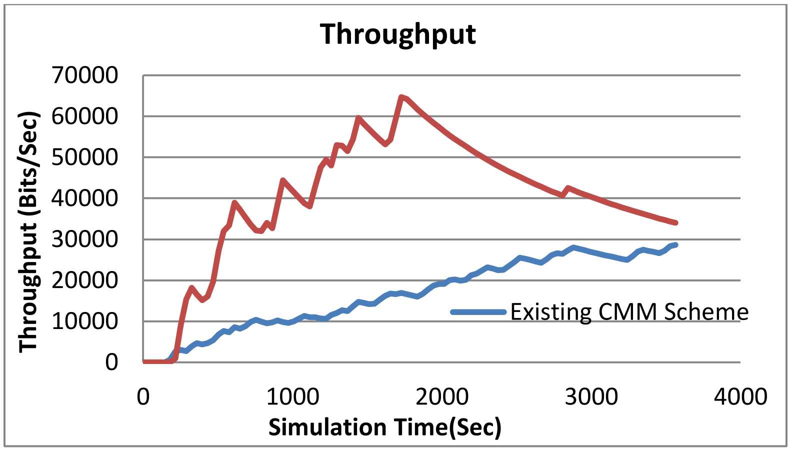


**Figure 4. Voice packet delay variation**

Packet loss ratio and packet delay variation are the important aspects in determining the guaranteed QoS. It is directly related to the handover latency and propagation environment. It is observed that the presented SDN-DMM based scheme provides a lower packet drop ratio and packet delay variation when compared to the CMM scheme as in Fig. 3 and Fig. 4.

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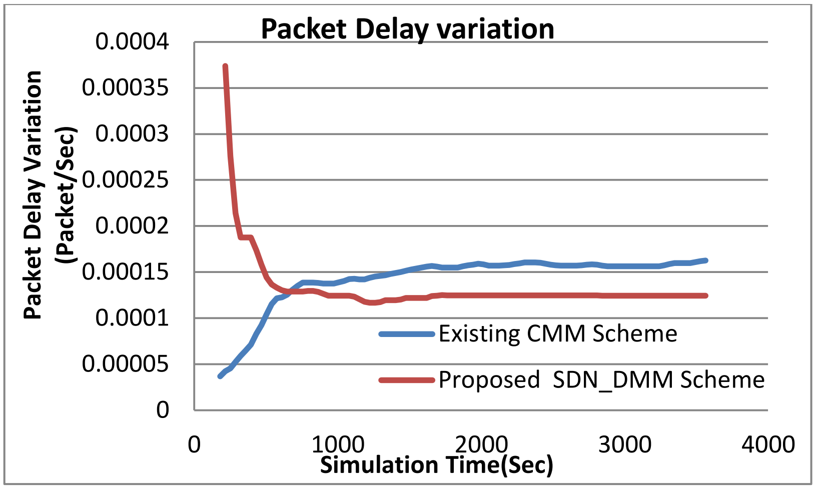


**Figure 5. Throughput**

The traffic now flows through the WiMAX network by balancing the network load and increases the overall throughput of the system as shown in Fig. 5. Table 1 shows the comparative performance of the proposed SDN-DMM based scheme and the existing CMM method.

**Table 1 Performance of CMM method and SDN-DMM scheme**

| Parameters | Existing CMM scheme | Proposed SDN-DMM Scheme |
|---|---|---|
| Handover delay (Sec) | 0.080 | 0.068 |
| Packet delay (packet/sec) | 18 | 12 |
| Throughput (bits/sec) | 27000 | 65000 |
| Packet delay variation (sec) | 0.00015 | 0.00012 |
| Traffic sent (bits/sec) | 30000 | 65000 |

## CONCLUSION:

The proposed SDN–DMM based mobility management optimizes handover procedures by proper selection of network path during the MN mobility. The combined SDN-DMM significantly minimizes the handover delay and packet loss ratio when compared to the existing CMM scheme. Simulation results prove the presented work is extremely well suitable for future generation network. Future work can be further extended to analyze the various protocols across different wireless access technologies.

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